A Locally Linear Transformations Based One Step Future Average Model For Dynamic State Systems

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ISBN: 9781694868145

A LOCALLY LINEAR TRANSFORMATIONS BASED ONE STEP FUTURE AVERAGE MODEL FOR DYNAMIC STATE SYSTEMS

DEDICATION

This text is dedicated to the all compassionate *Creator* of the *Universe*.

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ACKNOWLEDGMENTS

The author would like to express his deepest gratitude to all the members of his Loving Family, especially his ever loving son Rohith Rishi Bagadi, Respectable Teachers, En-Dear-Able Friends, Inspiring Social Figures, Highly Esteemed Professors, Reverence Deserving Deities that have deeply contributed in the formation of the necessary scientific temperament and the social and personal outlook of the author that has resulted in the conception, preparation and authoring of this research manuscript note. The author pays his sincere tribute to all those dedicated and sincere folk of academia, industry and elsewhere who have sacrificed a lot of their structured leisure time and have painstakingly authored treatises on Science, Engineering, Mathematics, Art and Philosophy covering all the developments from time immemorial until then, in their supreme works. It is standing on such treasure of foundation of knowledge, aided with an iota of personal god-gifted creativity that the author bases his foray of wild excursions into the understanding of natural phenomenon and forms new premises and scientifically surmises plausible laws. The author strongly reiterates his sense of gratitude and infinite indebtedness to all such '*Philosophical Statesmen*' that are evergreen personal librarians of Science, Art, Mathematics and Philosophy. Also, the author thanks deeply Professor Hussain Bahia, Late Professor Emeritus John Hoopes, Professor Jefferey Russell of the Department Of Civil & Environmental Engineering for their technical guidance and encouragement in the success of this research problem to its state of now, and its success as a former version that sufficed as a Master's Thesis in the Department of Civil & Environmental Engineering, University Of Wisconsin-Madison, USA, which the author acquired in the Fall of 2004. The author thanks profusely the aforementioned three Professors, and in addition, Professor Amir Assadi of the Mathematics Department, Professor Zeppenfeld and Professor Tao Han of the Physics Department, Professor Roderic Lakes of the Engineering Mechanics & Astronautics Department, all of the University Of Wisconsin-Madison, USA for the technical guidance and encouragement they offered during the authors stay as a Graduate Student at the University Of Wisconsin-Madison, USA. A great amount of thanks also goes to Professor Emeritus Millard Johnson of the Engineering Mechanics Department, Professor Peter Terwilliger and Professor Georgia Benkart of the Mathematics Department in helping the author form a sound mathematical temperament to aid his Scientific bent of mind.

1 INTRODUCTION

A Dynamical State System is actually a System that represents the dynamical evolution of a System with time, when the System attributes are denoted by the Dynamical Variables of concern. Characterization of such systems becomes very cumbersome when they have large number of Dynamical Variables. Unless a good history of evolution of a Dynamical State System is given to us, it is equally difficult to make a one-step forecast.

2 HIGHER ORDER SEQUENCE OF PRIMES

Since, the dawn of civilization, human kind has been leaning on the Sequence of Primes to devise Evolution Schemes akin to the behavior of the Distribution of Primes, in an attempt to mimic natural phenomenon and be able to forecast useful aspects of science of the aforementioned phenomenon. Many western and as well as oriental Mathematicians and Physicists have understood the importance of Prime Numbers (in the ambit of Quantum Groups, Hopf Algebras, Differentiable Quantum Manifolds, etc.,) in understanding subatomic processes such as Symmetry Breaking, Standard Model Explanation, etc. In this research note, the author advocates a novel concept of Higher Order Sequence Of Primes.

Theory Of Higher Order Sequence Of Primes [1], [2], [3])

A Positive Integer Number is considered as a Prime Number in a Certain Higher Order (Positive Integer ≥ 2) Space, say R, if it is factorizable into a Product of (R-1) factors wherein the factors are (R-1) number of Distinct Non-Reducible Positive Integer Numbers (Primes of 2nd Order Space, i.e., the Standard Primes we know of).

Example:

The general Primes that we usually refer to can be called as Primes of 2nd Order Space.

Example:

First Few Elements Of Sequence's Of Higher Order Space Primes	*R^th Order Space*
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, …}	R=2
{6 (3x2), 10 (5x2), 14 (7x2), 15 (5x3), 21 (7x3), 22 (11x2), 26 (13x2), 33 (11x3), 34 (17x2), 35 (7x5), 38 (19x2), 39, (13x3), 45 (9x5), ... }	R=3

{30 (5x3x2), 42 (7x3x2), 70 (7x5x2), 84 (7x4x3), 102 (17x3x2), 105 (17x3x2), 110 (11x5x2), 114 (19x3x2), 130 (13x5x2), ...}	R=4
{210 (7x5x3x2), 275 (11x5x3x2), 482 (11x7x3x2), 770 (11x7x5x2), 1155 (11x7x5x3), …}	R=5

We can note that the Primes of any Integral (Positive Integer ≥ 2) Order Space (say R) can be arranged in an increasing order and their position in this order denotes their Higher Order Space *Prime Metric Basis Position Number*.

We can generate the Sequence Of Any Integral (Positive Integer ≥ 2) Higher Order Primes in the following fashion:

The First Prime of any R^th Order Space Sequence Of Primes can be computed by simply considering consecutively the First (R-1) Number of Primes of 2nd Order Space Sequence Of Primes, starting from the First Prime of 2nd Order Space Sequence Of Primes, i.e., 2 and Forming a Product Term of the Form

$$ {}^{R}p_1 = \overbrace{\left\{{}^{2}2_1 \times {}^{2}3_2 \times {}^{2}5_3 \times {}^{2}7_4 \times \ldots\ldots\ldots\ldots \left\{{}^{2}p_{(R-3)}\right\} \times \left\{{}^{2}p_{(R-2)}\right\} \times \left\{{}^{2}p_{(R-1)}\right\}\right\}}^{(R-1)\ Number\ Of\ Product\ For\ming\ Factors} $$

which becomes the First Prime of any R^th Order (Positive Integer ≥ 2) Space Sequence Of Primes as it cannot be factored in terms of R Number of Unique Factors. We Label this Number as ${}^{R}p_1$

One Step Evolution [4], [5] of any element of Second Order Space Sequence Of Primes is the next consecutive Second Order Space Prime element of the given element of Second Order Space Sequence Of Primes. For Example, One Step Evolution of 2 is 3 and of 31 is 37.

The Second Prime of any R^th Order (Positive Integer ≥ 2) Space Sequence Of Primes can be computed in the following fashion.

Firstly, we consider consecutively the First (R-1) Number of Primes of 2nd Order Space Sequence Of Primes, starting from the First Prime of

2nd Order Space Sequence Of Primes, i.e., 2 and forming a Product Term of the form

$${}^{R}p_1 = \overbrace{\left\{{}^{2}2_1 \times {}^{2}3_2 \times {}^{2}5_3 \times {}^{2}7_4 \times \ldots\ldots\ldots\ldots \left\{{}^{2}p_{(R-3)}\right\} \times \left\{{}^{2}p_{(R-2)}\right\} \times \left\{{}^{2}p_{(R-1)}\right\}\right\}}^{(R-1)\ Number\ Of\ \text{Product}\ Forming\ Factors}$$

which becomes the First Prime of any Rth Order (Positive Integer ≥ 2) Space Sequence Of Primes as it cannot be factored in terms of R Number of Unique Factors. We now cause One Step Evolution of that one particular factor among the (R-1) factors such that the Product climb of the value ${}^{R}p_2$ over ${}^{R}p_1$ is minimum as compared to that gotten by performing the same using any other factor among the (R-1) factors.

{One Step Devolution [4], [5] of any element of Second Order Space Sequence Of Primes is the just previous Second Order Space Prime element of the given element of Second Order Space Sequence Of Primes. For Example, One Step Devolution of 3 is 2 and of 37 is 31}.

We find ${}^{R}p_3$ using ${}^{R}p_2$ as detailed in the above paragraph, and similarly, we can find any element of the R^{th} Order Sequence Of Primes.

For Example, 210 is the 1st (Higher Order Space Prime Metric Basis Position Number) element of R=5th Order Space Sequence Of Primes.

Similarly, 102 is the 5th (Higher Order Space Prime Metric Basis Position Number) element of R=4th Order Space Sequence Of Primes.

Therefore, any of these Higher Order Space Primes can be represented as follows:

$${}^{Higher\ Order\ Space\ Number}(Number)_{\text{Higher Order Space Prime Metric Basis Position Number}}$$

That is,

210 can be written as ${}^{5}210_1$ and 102 can be written as ${}^{4}210_5$.

Each of the rest of the Positive Integers can be classified to belong to it's Unique Parent Sequence Of Higher Non Integral Order Space Primes, at a particular Prime Metric Basis Position Number.

That is, for any Positive Integer, we can use the Method of One Step Evolution successively (as detailed in [4], [5]) and can find all the elements greater than it up to a certain limit. Similarly, we can use the Method Of One Step Devolution successively (as detailed in [4], [5]) and can find all the elements lower than it but greater than zero. These set of numbers when arranged in an order form a Sequence, namely the Sequence Of Higher (Positive Non Integer Order) Primes, of some particular Positive Non Integer Order.

For Example, One Step Evolution of 40,500 is 56,700, see [4], [5], i.e., if 40,500 is ${}^{R}40500_{d}$, then 56,700 is ${}^{R}56700_{(d+1)}$

Furthermore, as a matter of fact, any of rest of the positive integers other than the Sequence of Primes of Any Higher Order (Positive Integer greater than or equal to 2) Space can be written as follows:

Coarser Representation Of positive integers other than the Sequence of Primes of Any Higher Order (Positive Integer greater than or equal to 2) Space

Considering any number say f, we can write its nearest primes of any Rth Order Space, on either side as ${}^{R}p_k$ and ${}^{2}p_{k+1}$, where ${}^{R}p_k$ is the k^{th} Prime and ${}^{R}p_{k+1}$ is the $(k+1)^{th}$ Prime of the Sequence Of Primes Of the Rth Order (Positive Integer ≥ 2) Space. We can then write

$$f = {}^{R}p_{k+\alpha} \quad \text{where} \quad \alpha = \left(\frac{f - {}^{R}p_k}{{}^{R}p_{k+1} - {}^{R}p_k}\right)\left(\frac{{}^{R}p_{(f-{}^{R}p_k)}}{{}^{R}p_{({}^{R}p_{k+1}-{}^{R}p_k)}}\right) \quad \text{with}$$

$0 < \alpha < 1$. Then, $(k+\alpha)$ is the Non Integral Prime Basis Position Number of f. In a similar fashion, any Rational Number $\frac{a}{b}$ can be written as $\frac{a}{b} = \frac{{}^{R}p_{k+\alpha}}{{}^{R}p_{l+\beta}}$ where k, l are some positive integers and $0 < \alpha, \beta < 1$.

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2 HIGHER ORDER SEQUENCE(S) OF FRACTIONAL PRIMES

Finer Representation Of Any Natural Number In Terms Of Primes Basis Position Number Of Any Positive Integer Order Sequence Of Primes

Considering any Natural Number q, and any Positive Integer Order Number r, we first find two r^{th} Order Sequence Primes that bound r, i.e., ${}^{r}p_{u_1} < q < {}^{r}p_{u_1+1}$ where u_1 is a Positive Integer such that ${}^{r}p_{u_1}$ is the Largest r^{th} Order Sequence Of Primes element that is less than q and p_{u_1+1} is the Smallest r^{th} Order Sequence of Primes element that is greater than q.

Then q can be represented as

$$q = {}^{r}p_{v} \text{ where } v = u_1 + \left\{ \frac{q - {}^{r}p_{u_1}}{{}^{r}p_{u_1+1} - {}^{r}p_{u_1}} \right\} = u_1 + \left(\frac{\delta_{N1}}{\delta_{D1}} \right)$$

However, we can note that this is not the Best Representation for v. Therefore, we multiply $\left(q - {}^{r}p_{u_1}\right)$ by a Smallest Natural Number a_1 such that $a_1\left(q - {}^{r}p_{u_1}\right) \geq {}^{r}p_{u_1+1}$. Therefore, we now also multiply the value $\left({}^{r}p_{u_{1+1}} - {}^{r}p_{u_1}\right)$ by a_1 as well. Now, we inspect the Set of r^{th} Order Primes for an element ${}^{r}p_{u_{N1}}$ such that ${}^{r}p_{u_{N1}}$ is the Largest r^{th} Order Sequence of Prime Element (of Position Number u_{N1}) which is less than $a_1\left(q - {}^{r}p_{u_1}\right)$ and similarly, we inspect the Set of r^{th} Order Primes for an element ${}^{r}p_{u_{D1}}$ such that ${}^{r}p_{u_{D1}}$ is the Largest r^{th} Order Sequence of Prime Element (of Position Number u_{N1}) which is less than $a_1\left({}^{r}p_{u_{1+1}} - {}^{r}p_{u_1}\right)$.

Therefore, we can write

$$\left(\frac{\delta_{N1}}{\delta_{D1}}\right)=\left(\frac{{}^{r}p_{u_{N1}}}{{}^{r}p_{u_{D1}}}\right)+\left(\frac{\delta_{N2}}{\delta_{D2}}\right)$$

We again re-write

$$\left(\frac{\delta_{N2}}{\delta_{D2}}\right)=\left(\frac{{}^{r}p_{u_{N2}}}{{}^{r}p_{u_{D2}}}\right)+\left(\frac{\delta_{N3}}{\delta_{D3}}\right)$$

Using the aforementioned scheme analogously and keep finding the best or accurate possible value by doing as many iterations as necessary for the desired accuracy.

To elaborate further, we write the Residue

$\left(\frac{\delta_{N1}}{\delta_{D1}}\right)-\left(\frac{{}^{r}p_{u_{N1}}}{{}^{r}p_{u_{D1}}}\right)=\left(\frac{\delta_{N2}}{\delta_{D2}}\right)$, i.e., as a Fraction whose Numerator and Denominator are both Natural Numbers. We then find ${}^{r}p_{u_{N2}}$ such that it is the Largest element of the r^{th} Order Sequence Of Primes Set and which is Smaller than δ_{N2}. Similarly, we find ${}^{r}p_{u_{D2}}$ such that it is the Largest element of the r^{th} Order Sequence Of Primes Set and which is Smaller than δ_{D2}. We now write the Residue

$$\left(\frac{\delta_{N2}}{\delta_{D2}}\right)-\left(\frac{{}^{r}p_{u_{N2}}}{{}^{r}p_{u_{D2}}}\right)=\left(\frac{\delta_{N3}}{\delta_{D3}}\right)$$

We should note that if δ_{N2} and δ_{D2} are Small Numbers, we can multiply the δ_{N2} and δ_{D2} by some Natural Number a_2 such that they are sufficiently large enough to capture the desired accuracy of our representation. We can note that in the relation $a_1\left(q-{}^{r}p_{u_1}\right)\geq {}^{r}p_{u_1+1}$ already mentioned, we can have a_1 replaced by a Natural Number much larger than a_1 so as to capture the desired accuracy of our representation. We can now re-write

$$\left(\frac{\delta_{N3}}{\delta_{D3}}\right)-\left(\frac{{}^{r}p_{u_{N3}}}{{}^{r}p_{u3}}\right)=\left(\frac{\delta_{N4}}{\delta_{D4}}\right)$$

In this fashion, we can represent any number q in terms of a Non Integral Prime Basis Position Number of r^{th} Order Sequence Of Primes. That is, we can write

$$q={}^{r}p_{v}$$

$$q={}^{r}p_{u_1+\left(\frac{\delta_{N1}}{\delta_{D1}}\right)}$$

And so on, so forth as,

$$q={}^{r}p_{u_1+\sum_{i=1}^{\infty}(\xi_{uNi})}$$

where

$$\xi_{uNi}=\left(\frac{r_{puNi}}{r_{puDi}}\right)$$

3 THE RL NORMALIZATION SCHEME

The RL-Norm

For Normalization scheme, when we have to Normalize a Set of Real Numbers, we can use the concept of RL-Norm, i.e., normalization in the R Space where R is the Prime Basis Position Number in L[th] Order Sequence Of Primes Representation of the Highest Value of the Set Of Real Numbers. For L=2, it reduces to Representation in Standard Sequences Of Primes Basis. That is, we can write the RL-Norm of a Set of Real Numbers

If, x_{1i} and x_{2i} are two n dimensional points, then

$$dist(RL\underset{for\ i=1\ to\ n}{Norm}(x_{1i},x_{2i}))=$$

$$\left\{\sum_{i=1}^{n}\left\{\left(x_{1i}-x_{2i}\right)^{\left\{G_{PBPN}\left\{\underset{for\,all\,i}{Max}\left(x_{1i},x_{2i}\right)\right\}\right\}}\right\}\right\}^{\left\{\frac{1}{G_{PBPN}\left\{\underset{for\,all\,i}{Max}\left(x_{1i},x_{2i}\right)\right\}}\right\}}$$

Therefore, any RL-Norm type Normalization simply takes the form

$$RL\,Norm(x_i)=\frac{(x_i)}{\left\{\sum_{i=1}^{n}\left\{(x_i)^{\left\{G_{PBPN}\left\{\underset{for\,all\,i}{Max}(x_i)\right\}\right\}}\right\}\right\}^{\left\{\frac{1}{G_{PBPN}\left\{\underset{for\,all\,i}{Max}(x_i)\right\}}\right\}}}$$

Here, G_{PBPN} is the Prime Basis Position Number of the greatest value of x_{1i} for the above formula and G_{PBPN} is the Prime Basis Position Number of the greatest value of (x_{1i},x_{2i}) for the formula above the above formula.

4 THE PRIMALITY TREE MATRIX OF ANY POSITIVE NUMBER

As Primes are unique in the sense that they cannot be factorized as a product of other positive integers other than themselves and 1, we can note that these are unique bases provided to us by the nature to explain every countable phenomena using these bases.

Therefore, then, any positive integer should be expressible as a sum of Primes, with possible repetition of some or all bases.

For Example

27=1+2+3+5+7+(9)

which can further be written as

27=1+2+3+5+7+

1+2+3+0+0+

1+2+0+0+0 i.e.,

$$27=3|1\rangle+3|2\rangle+2|3\rangle+1|5\rangle+1|7\rangle$$

where, $|1\rangle,|2\rangle,|3\rangle,|5\rangle,|7\rangle$ are representations for the Prime Bases namely 1, 2, 3, 5, 7.

The Matrix $\begin{bmatrix}1&2&3&5&7\\1&2&3&0&0\\1&2&0&0&0\end{bmatrix}$ can be thought of as *Primality Matrix* or *Primality Tree Matrix* for the Number 27, denoted as PTM_{27}.

Therefore, it can be noted that every Positive Integer z is

a *(Discrete) Function*, actually a 2 Variable Function where each Variable takes the values of the Sets $V_r = \{1,2,3,..., m_{(z-1)}, m_z\}$) and $V_c = \{1,2,3,..., n_{(z-1)}, n_z\}$ with $f(V_r, V_c) = \{PTM_z(V_r, V_c)\}$ spanning the dimensions $_{V_r=1\ to\ m_z}^{V_c=1\ to\ n_z}$ of the *Primality Tree Matrix* PTM_z where m_z is the number of Rows of PTM_z and n_z is the number of Columns of PTM_z

It should be noted that in the construction of the aforesaid Primality Tree Matrix, the decomposition of the residue after each step of decomposition as detailed, should be such that, in every row of it, the values should be consecutive Primes starting from 1 along the column numbers, i.e., they should be in ascension as dictated by the Sequence of Primes starting from 1, and this how any Residue is to computed for any further decompositions, as said.

For this Example, it can be noted that the First Residue after the aforesaid type of decomposition shown in the first row of the above matrix is 9, and the Second Residue after the aforesaid type of decomposition shown in the second row of the above matrix is 3 and the Third Residue after the aforesaid type of decomposition shown in the third row of the above matrix is 0. We stop building the Primality Tree Matrix further, when the Residue comes to a zero value.

Addition and Subtraction Of Primality Tree Matrices Of A Given Positive Numbers $z1$ *and* $z2$

If the size of the Primality Tree PTM_{z1} is $m_{z1} \times n_{z1}$ and the size of the Primality Tree PTM_{z2} is $m_{z2} \times n_{z2}$, we pick the larger of (m_{zi}, n_{zi})rifor $i = 1, 2$ and augment the Primality Tree Matrics of $z1$ and $z2$ of sizes $m_{z1} \times n_{z1}$ and $m_{z2} \times n_{z2}$ to a common size of $\{Max(m_{z1}, m_{z2})\} \times \{Max(n_{z1}, n_{z2})\}$ and we insert zeroes in the places of positions that are vacant when we write each of the

aforementioned Primality Tree Matrices in this new augmented fashion.

Therefore when $APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}}$ and $APTM_{z2\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}}$ are the augmented matrices, then

$APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}} \pm APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}} =$

$APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}}(i,j) \pm$

$APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}}(i,j)$

where $i, j = 1 \ \ to \ \ \{Max(m_{z1}, m_{z2})\} \times \{Max(n_{z1}, n_{z2})\}$

Also, it should be noted that

$APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}}(i,j) = PTM_{z1}(i,j)$

for $i = 1\ to\ m_{z1}$ and $= 1\ to\ n_{z1}$ and

$APTM_{z1\{Max(m_{z1},m_{z2})\}\times\{Max(n_{z1},n_{z2})\}}(i,j) = 0$

in elsewhere locations when

$m_{z1} < i < Max(m_{z1}, m_{z2})$ and

$n_{z1} < j < Max(n_{z1}, n_{z2})$

Computation Of Similarity Of Two Positive Integers Using RL-Norm (for G=2 case)

For, the aforesaid computation of Similarity of two positive integers, we first find their Primality Tree Matrices of the same and also appropriately augment them as detailed already to be to compare them. We then find the R value which is the Highest Value of the Set Of Real Numbers that constitute the afore-constructed Matrices. We now compute the RL Norm values of each element of the Matrix and then simply compute the Similary between the two considered Positive Numbers as follows:

$$Similarity(z1,z2)=\sum_{j=1}^{Max(n_{z1},n_{z2})}\sum_{i=1}^{Max(m_{z1},m_{z2})}\left\{\widetilde{PMT}_{z1}(i,j)\widetilde{PMT_{z1}}(i,j)\right\}$$

where, the $\widetilde{PMT}_{z1}(i,j)$ indicates that every element of the matrix is RL-Normalized. And the same is implied for

$\widetilde{PMT}_{z2}(i,j)$

Here, we should use 1 as the First Prime we have already used it so in the constructing of Primality Tree Matrix of any Positive Integer, though we can use 2 as the First Prime for the Computation of the RL Norm, exclusively for its own sake when its use finds situations where uniformly 2 is used as the First Prime. However, when we find Similarity using RL Norm, the RL-Norm should be calculated using 1 as the First Prime.

5 A DYNAMICAL STATE SYSTEM

A Dynamical State System is actually a System that represents the dynamical evolution of a System with time, when the System attributes are denoted by the Dynamical Variables of concern. Characterization of such systems becomes very cumbersome when they have large number of Dynamical Variables. Unless a good history of evolution of a Dynamical State System is given to us, it is equally difficult to make a one-step forecast. A snap shot or a Dynamical State System at any instant $t=j$ is given by $X(t=j)_{1xn}$, where $1\times n$ represents that any Dynamical State is represented by a row vector of size n, where n represents the number of Dynamical Variables. And a Complete Dynamical System is represented by $X(t)_{1xn}$ for $t=1\ to\ m$, if the history of the Dynamical State System for m instants is known. Also, $m>>n$.

The task in this research problem is to find $X(t=m+1)_{1xn}$.

6 THE LOCALLY LINEAR TRANSFORMATION MATRIX

Firstly, we normalize each of the row Vector of the Dynamic State System, i.e., $X(t=j)_{1xn}$, for all $j=1\ to\ n$, using the RL Normalization Scheme detailed already in Chapter 3. Let these be denoted by $\widetilde{X}(t=j)_{1xn}$, for all $j=1\ to\ n$.

Now, we consider $\widetilde{X}(t=m)_{1xn}[q]$ where the notation indicates that $\widetilde{X}(t=m)_{1xn}[q]$ is the q^{th} co-ordinate of $\widetilde{X}(t=m)_{1xn}$ where $1 \le q \le n$.

For every $\widetilde{X}(t=m)_{1xn}[q]$, we find a $\widetilde{X}(t=j_q)_{1xn}[q]$ with $1 \le j_q < m$ such that $\Delta_{j_q} = \left\{\widetilde{X}(t=m)_{1xn}[q]\right\} - \left\{\widetilde{X}(t=j_q)_{1xn}[q]\right\}$ is a minimum. Let the index of n,m where this happens for $\widetilde{X}(t=m)_{1xn}[q]$ be denoted by j,q or more succinctly as j_q.

We now construct a Diagonal Matrix in the fashion given by

$$T_{m,(m+1)}[q,q] = \frac{\left\{\widetilde{X}(t=j_q+1)_{1xn}[q]\right\}}{\left\{\widetilde{X}(t=j_q)_{1xn}[q]\right\}} \qquad \text{for} \qquad q=1 to\ n$$

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First, we find the ξ at which $Max\left\{\widetilde{X}(t=m)_{1xn}[q]\right\}$ happens for $q=1 to\ n$. That is, $\left\{\widetilde{X}(t=m)_{1xn}[\xi]\right\} = Max\left\{\widetilde{X}(t=m)_{1xn}[q]\right\}$

We then write every other $\underbrace{\left\{\widetilde{X}(t=m)_{1xn}[q]\right\}}_{\substack{q\neq\xi \\ q=1\ to\ n}}$ as

$$\underbrace{\left\{\widetilde{X}(t=m)_{1xn}[q]\right\}}_{\substack{q\neq\xi \\ q=1\ to\ n}} = \frac{1}{g_{q\xi}}\left\{\widetilde{X}(t=m)_{1xn}[\xi]\right\}$$ where $q_{q\xi}$ is a constant which varies with varying q.

Now, we write

$$\left\{\widetilde{X}(t=m+1)_{1xn}[q]\right\} = \left\{\widetilde{X}(t=m)_{1xn}[q]\right\}\left\{T_{m,(m+1)}[q,q]\right\}$$

Furthermore, we can write

$$M \cdot \left\{\widetilde{X}(t=m+1)_{1xn}[\xi]\right\} = \left\{X(t=m+1)_{1xn}[\xi]\right\}$$

Where M can now be re-written as

$$M = \left[\left\{\widetilde{X}(t=m+1)_{1xn}[\xi]\right\}^z + \underbrace{\sum_{q=\{\phi\}}\left\{\left\{\frac{1}{g_{q\xi}}\right\}\widetilde{X}(t=m+1)_{1xn}[\xi]\right\}^z}_{where\ \{\phi\}=\{1,2,3,.....n\}-\{\xi\}}\right]^{\frac{1}{z}}$$

which can be further written as

A LOCALLY LINEAR TRANSFORMATIONS BASED ONE STEP FUTURE AVERAGE MODEL FOR DYNAMIC STATE SYSTEMS

$$M=\left[\left\{\widetilde{X}\left(t=m+1\right)_{1xn}\left[\xi\right]\right\}^{z}\left\{1+\underbrace{\sum_{q=\{\phi\}}\left\{\frac{1}{g_{q\xi}}\right\}^{z}}_{where\ \{\phi\}=\{1,2,3,.....n\}-\{\xi\}}\right\}\right]^{\frac{1}{z}}$$

which gives

$$M=\left\{\widetilde{X}\left(t=m+1\right)_{1xn}\left[\xi\right]\right\}\left\{1+\underbrace{\sum_{q=\{\phi\}}\left\{\frac{1}{g_{q\xi}}\right\}^{z}}_{where\ \{\phi\}=\{1,2,3,.....n\}-\{\xi\}}\right\}$$

We now write the above as

$$M=\left\{\widetilde{X}\left(t=m+1\right)_{1xn}\left[\xi\right]\right\}\left\{1+\underbrace{\sum_{q=\{\phi\}}\left\{\frac{1}{g_{q\xi}}\right\}^{z}}_{where\ \{\phi\}=\{1,2,3,.....n\}-\{\xi\}}\right\}=$$

$$\begin{Bmatrix}Number\\Correspondng\\To\ {}^{2}p_{z}\end{Bmatrix}$$

From the above equation, we can find the best value of z. Hence, we can find now all of $X\left(t=m+1\right)_{1xn}$. This is the One Step Future Average Model of $X\left(t=m\right)_{1xn}$. It can be noted that as we keep varying the value of z, only for the most optimal value of z value, the Matrix generated in the fashion $G\left[i,\xi\right]=\frac{X\left(t=m+1\right)_{1xn}\left[i\right]}{X\left(t=m+1\right)_{1xn}\left[\xi\right]}$ for $i=1\ to\ n$ would be Most Similar (Using Similarity Analysis Method detailed in Chapter 4) to $\widetilde{G}\left[i,\xi\right]=\frac{\widetilde{X}\left(t=m+1\right)_{1xn}\left[i\right]}{\widetilde{X}\left(t=m+1\right)_{1xn}\left[\xi\right]}$ for $i=1\ to\ n$

ABOUT THE AUTHOR

After serving in the Engineering domain as a Graduate Teaching Assistant, Assistant Professor, Associate Professor & Head during 1999-2019, now, Mr. Ramesh Chandra Bagadi is currently splitting his time as a *Technology Entrepreneur* developing solutions to latest cutting edge technologies of the futuristic kind and as an *Author Of Self Help Books*. He has received his Bachelors of Civil Engineering from Osmania University, India and a Masters each in Engineering Mechanics, Civil & Environmental Engineering, Physics from the University Of Wisconsin-Madison, USA. He is also a Registered Chartered Engineer and Fellow of The Institution Of Engineers, India.

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